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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,280	02/20/2008	Johannes Meerdink	2144.000800/RFE	2928
23720 7590 08/01/2011 WILLIAMS, MORGAN & AMERSON 10333 RICHMOND, SUITE 1100 HOUSTON, TX 77042			EXAMINER COVINGTON, RAYMOND K	
			ART UNIT 1622	PAPER NUMBER
			MAIL DATE 08/01/2011	DELIVERY MODE PAPER

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte JOHANNES MEERDINK and  
NILS DAN ANDERS SADERGARD

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Appeal 2011-003179  
Application 10/582,280  
Technology Center 1600

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Before DEMETRA J. MILLS, FRANCISCO C. PRATS, and  
JEFFREY N. FREDMAN, Administrative Patent Judges.

FREDMAN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 involving claims to a process for purification of lactide. The Examiner rejected the claims as obvious. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

## Statement of the Case

### Background

“This invention relates to an improved process for the purification of lactide from a crude lactide vapour product stream comprising at least said lactide, lactic acid, water and linear lactic acid oligomers” (Spec. 1, ll. 5-8).

### The Claims

Claims 1-21 are on appeal. Claim 1 is representative and reads as follows:

1. A process for the purification of lactide from a crude lactide vapour product stream comprising at least said lactide, lactic acid, water and linear lactic acid oligomers, said crude lactide vapour product stream being produced by depolymerisation of low molecular weight polylactic acid in a reactor, which process comprises the steps of:

(a) feeding said vapour product stream to a rectification column having a feed inlet at the lower end of the column and an overhead vapour outlet at the upper end of the column, through the said feed inlet, said column being mounted onto the reactor such that components from the vapour product stream liquefying within the column are allowed to flow back into the reactor;

(b) establishing at the upper end of the column a first overhead vapour fraction consisting essentially of water, lactic acid and lactide, and at the lower end of the column a high-boiling fraction consisting essentially of lactide and higher-boiling linear lactic acid oligomers;

(c) condensing from said first overhead vapour fraction by means of a condenser at least the lactide to obtain a first liquid lactide containing condensate fraction;

(d) removing the first liquid lactide containing condensate fraction.

The issue

The Examiner rejected claims 1-21 under 35 U.S.C. § 103(a) as obvious over O'Brien<sup>1</sup> and Drysdale<sup>2</sup> (Ans. 3-4).

The Examiner finds that "O'Brien et al and Drysdale et al teach a process for the purification of lactide by condensing the vaporous reaction mixture, removing lactic acid and water as an overhead fraction, removing a higher boiling bottom fraction and a recycling step" (Ans. 4). The Examiner finds that to "use somewhat different but otherwise analogous process parameters in an otherwise well-known purification technique would have been obvious to [o]ne of ordinary skill in the art as the results, purified product, would not have been unexpected" (Ans. 4).

Appellants contend that "[n]either O'Brien nor Drysdale teach or suggest such a rectification column, let alone one mounted on the reactor as recited [in claim 1]" (App. Br. 6). Appellants specifically argue that "O'Brien fails to disclose a process according to the present invention since: (1) there is no rectification column mounted on a lactide reactor in a manner such that condensate from the column can be continuously returned to the reactor; and (2) there is no vapor-phase purification of crude lactide." (App. Br. 6).

Appellants contend that "Drysdale also fails to disclose a process according to the present invention since: (1) there is no rectification column

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<sup>1</sup> O'Brien et al., US 5,521,278, issued May 28, 1996.

<sup>2</sup> Drysdale et al., US 5,236,560, issued Aug. 17, 1993.

mounted on a lactide reactor in a manner such that condensate from the column can be continuously returned to the reactor; and (2) the feed stream to the purification step (distillation) is a liquid condensate and is not a vapor.” (App. Br. 7).

Appellants contend that the “the Examiner is attempting to argue one teaching of O’Brien--that of condensing a vaporous reaction mixture and fractionating the resulting condensate--is the equivalent of two different steps of the present invention” (App. Br. 10).

The issues with respect to this rejection are: Does the evidence of record support the Examiner’s conclusion that O’Brien and Drysdale render obvious the method of claim 1?

#### Findings of Fact

1. O’Brien teaches a process for manufacturing purified lactide which comprises the step:

Contacting the molten condensation polymer with an alkali metal-free depolymerization catalyst in a cracking zone operated at a liquid temperature no higher than 240° C. and pressure sufficient to effect cracking of the molten condensation polymer with the concomitant formation of (1) a vaporous reaction mixture containing water, lactic acid, lactide and entrained heavy oligomers and (2) molten liquid heavy ends containing heavy oligomers

(O’Brien, col. 2, ll. 45-53)

2. O’Brien teaches a next step of “[r]emoving the vaporous reaction mixture from the cracking zone at a rate such that the average residence time of the lactide vapor within the cracking zone is less than 15 seconds” (O’Brien, col. 2, ll. 54-57).

3. O'Brien teaches a next step of "[c]ondensing the vaporous reaction mixture and fractionating the condensate therefrom whereby lactic acid, water and minor amounts of lactide are removed as vapor overhead, concentrated lactide is removed as a liquid side stream and the heavy ends are removed as molten liquid" (O'Brien, col. 2, ll. 58-62).

4. O'Brien teaches that

The vapor overhead stream from the oligomer cracker contains substantial quantities of lactide. However, the stream also contains substantial quantities of impurities such as water, light decomposition products and entrained liquids such as oligomers and other heavy ends, which must, of course, be separated from the lactide. In the process of the invention, this is preferably done in a two-stage operation which involves condensing the cracker overhead to separate the more volatile materials and then fractionally distilling the lactide-enriched condensate.

(O'Brien, col. 8, l. 60 to col. 9, l. 3).

5. O'Brien teaches that "[s]ieve plate distillation trays, each bearing a liquid layer of unconverted oligomer, have been found to be very effective to mix the feed, vapor and liquid intimately and thus to improve reaction efficiency" (O'Brien, col. 8, ll. 5-8).

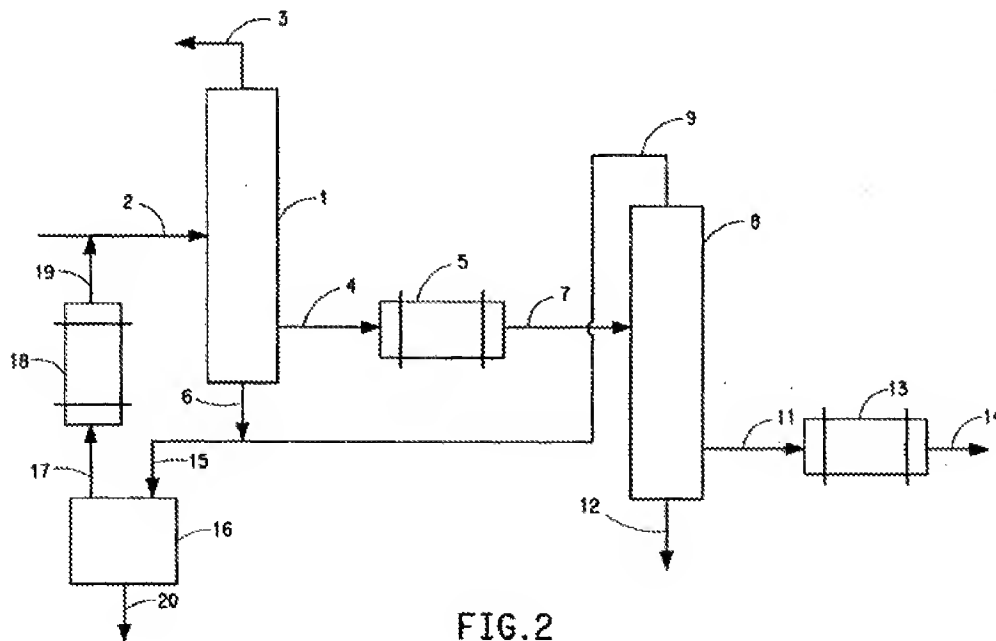
6. Drysdale teaches that "impure cyclic ester as defined can be separated from its impurities and obtained thereby as polymer grade material by distillation means alone, more particularly by fractional distillation at temperatures and pressures that minimize acid-producing side reactions. The solventless distillation process of this invention is surprisingly effective" (Drysdale, col. 2, l. 66 to col. 3, l. 4).

7. Drysdale teaches “means for recycling the various vapor and liquid streams along the process loop” (Drysdale, col. 3, ll. 20-21).

8. Drysdale teaches that the “overhead stream exiting line 3, which is rich in water and lactic acid and may contain lactide can be dehydrated if necessary and fed to an oligomerization reactor (not shown) for conversion to a depolymerizable lactic acid oligomer as is known in the art” (Drysdale, col. 6, ll. 34-38).

9. Drysdale teaches that “molten lactide condensed in 5 can be further refined, if desired, to provide still lower-acid content material by feeding the condensate from 5 through line 7 to a second fractionating column 8” (Drysdale, col. 6, ll. 17-21).

10. Figure 2 of Drysdale is reproduced below:



“FIG. 2 is a schematic representation of an integrated fractional distillation system” (Drysdale, col. 3, ll. 16-17).

### Principles of Law

“In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. Only if that burden is met, does the burden of coming forward with evidence or argument shift to the applicant.” *In re Rijckaert*, 9 F.3d 1531, 1532 (Fed. Cir. 1993).

“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

### Analysis

The Examiner has not met the burden of presenting a prima facie case of obviousness in this application. As Appellants correctly note, neither the O’Brien nor Drysdale reference teaches “a rectification column having a feed inlet at the lower end of the column and an overhead vapour outlet at the upper end of the column, through the said feed inlet, said column being mounted onto the reactor such that components from the vapour product stream liquefying within the column are allowed to flow back into the reactor” (emphasis added) as required by claim 1. As noted in the Specification, a significant feature of Appellants’ invention is that the rectification column, from which the desired lactide product is withdrawn at the upper end, is “mounted with its lower end onto the reactor” such that the non-lactide “components liquefying in the rectification column are allowed to directly flow back into the reactor to enable re-participation in the



depolymerisation reaction,” which eliminates the use of a prior art purge stream to improve lactide yield (Spec. 6).

We agree with the Examiner that O’Brien appears to teach recycling of the liquefying components from a fractionating column to the original reactor (O’Brien, col. 9, ll. 15-17 (“Heavy ends from the lactide distillation can be recycled to the lactide vacuum distillation column or they can be recycled to one of the dehydration stages.”) (emphasis added)). However, insofar as we can ascertain, O’Brien never teaches that the column should be mounted onto the reactor, and the Examiner has not explained why an ordinary artisan would have been prompted to adopt the configuration recited in claim 1.

While Drysdale generally teaches that the “purge (heel) taken from the bottom of the column, which is rich in oligomeric acids and contains some cyclic ester can be recycled to the depolymerization step for conversion to additional quantities of cyclic ester” (Drysdale, col. 5, ll. 53-57), the Examiner does not identify, and we do not find, any teaching in Drysdale that suggests mounting the column “onto the reactor” to allow liquefying components from the vapour stream to flow directly back into the original reactor as required by claim 1. At best, Drysdale teaches recycling the bottoms stream 6 through a distinct line 15 rather than directly mounting the column to the initial reactor (see FF 10).

The Examiner argues that “recycling reaction components back to a reactor is an obvious expedient well-known to a person of ordinary skill in the chemical arts” (Ans. 4-5).

We are constrained to agree with Appellants that this argument lacks evidentiary support explaining why an ordinary artisan would have adopted the configuration of claim 1, in which the lactide purification column is mounted directly onto the reactor, since neither O'Brien nor Drysdale teach this type of recycling. It is the Examiner's burden to provide teachings from the prior art of the elements being used to render the claim obvious. *Rijckaert*, 9 F.3d at 1532. We are therefore constrained to reverse the rejections in the absence of a teaching or suggestion of a rectification column which would satisfy the requirements of claim 1 in either O'Brien or Drysdale, or their combined teachings.

#### Conclusions of Law

The evidence of record does not support the Examiner's conclusion that O'Brien and Drysdale render obvious the method of claim 1.

#### SUMMARY

In summary, we reverse the rejection of claims 1-21 under 35 U.S.C. § 103(a) as obvious over O'Brien and Drysdale.

#### REVERSED

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